

Preface

This issue contains a group of papers on a wide range of research and development topics in magnetic recording. These papers, rather than being the outgrowth of a single development program, report new and innovative results from the various disciplines in disk file and tape file technologies.

There has been in the computer industry about 25 years of growth in machine design, materials and components development, and coding techniques. Nevertheless, there is still a continuing enrichment of the state of the art and a vigorous effort in development work in magnetic recording. The present advances are of particular interest in view of recent progress in other storage technologies, e.g., those utilizing magnetic bubble, semiconductor, or optical techniques.

The significance of the results reported here lies in the character of the contribution of each paper to its special field. There are essentially five topics. Papers in the first category show the relations between design of a disk facility and some of the underlying component technologies. The second group reports research on the interface between head and recording surface for both rigid substrates and flexible media. In the third category, contributions to head technology describe recent research on the thin-film head. The remaining two categories include some experimental studies on magnetic characteristics of disk and tape recording media and a new coding technique. The content of the papers is indicated briefly here.

• *Machine configurations*

Lennemann uses a waterflow modeling method to study the effects of various air inflow patterns on the stability of disk rotation. The author shows that proper positioning of the shroud and the access arm can reduce flutter by an order of magnitude.

Mulvany discusses the design rationale for the new hardware engineering features of the IBM 3340 and for the data-module concept of the IBM 3348, in which the head structure is integrated directly into the interchangeable disk pack.

Oswald shows how the track-following servo for the 3340 was designed to minimize settling time and displacement error while guaranteeing stability. Emphasis is given to the encoding and demodulation of servo readback signals from the recorded servo band.

• *Head-media interfaces*

Stahl, White, and Deckert describe a new approach to the analysis of wide foil bearings, using linearized equations. Compressibility and slip flow are retained in the fluid-mechanics equation; flexural rigidity and high-speed dynamic effects are retained in the tape equation. The novel form of the transient solution accounts for inertia in the tape and squeeze-film effects.

Vogel and Groom provide an experimental study of elastic foil behavior, which supports the computational model of Stahl et al.

Fleischer and Lin report an infrared interferometric technique for measuring air-bearing thicknesses of less than one micrometer on a disk.

Tseng and Talke have developed an experimental technique to study the transition from boundary lubrication to fully hydrodynamic lubrication in the 0.125- to 0.25- μm spacing range. Results apply to air-lubricated slider bearings in disk files.

• *Head technologies*

Bajorek, Coker, Romankiw, and Thompson describe the basic initial development of a high-performance magnetoresistive transducer to meet the unique requirements of a hand-held wand. Their design accommodates the special requirements of a wand travel velocity that is both low and variable and gives accurate registration in the hand-held sensing operation.

Hempstead analyzes the thermal response of a magnetoresistive head to frictional heating caused by dust particles or other asperities on the surface of a moving medium. For heads with narrow track widths, the thermal noise amplitude is comparable to the magnetically induced signal.

The paper by Cole, Potter, Lin, Deckert, and Valstyn gives numerical calculations of pulse shapes, output amplitudes, and resistivities for a shielded magnetoresistive recording head, in comparison with previous analytic results and with experimental data for recording heads of a relatively new design.

• *Recording medium technologies*

Comstock and Moore report experimental work on the magnetic properties and recording performances of disks with very thin ferrite films prepared by chemical vapor deposition.

Bate and Dunn measure the in-plane and the perpendicular components of the remanence a tape acquires on passing through the steady field of a recording head. They show that the perpendicular component of the field from the writing head has adverse effects on the remanence of the tape, and that this may impair high-density recording.

Su and Williams make a comparative study of some distinct differences in dc-erase noise in various film and particulate coatings on disks. A model provides a means of estimating the percentage of particles that agglomerate.

Thornley and Williams investigate the differences in frequency response of various recording surface materials. Their work suggests some potential limitations of recording media which are of interest in the present trend toward extremely high data rates.

• *Signal processing*

Patel and Hong present a new coding scheme for an error-correcting code that is compatible with the recently increased bit densities in tape drives and with the standard nine-track, half-inch tape format.

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